GPS Receiver

GM-168

Please read this manual before operating the unit

© ETEK NAVIGATION, INC.

ETEK NAVIGATION, INC.
TEL: 886-2-26860199 FAX: 886-2-26866159
10F, NO. 105, Xicheng Rd., Banqiao City,
Taipei County 220, Taiwan (R.O.C.)
E-Mail: etek@etek.com.tw
http://www.etek.com.tw

Version: 2

Content

Installation 3
Troubleshooting 5
GM-168 Introduction 6
GM-168 Key Feature 6
Possible Application 6
Familiarize your GM-168 6
Dimensions 6
Interface 7
Water-proof housing with magnet on the bottom 7
LED Light 7
GM-168 Computer/Lap top and handheld device cable 7
Software Interface 9
NMEA Protocol 9
NMEA Messages 9
GLL – Geographic Position – Latitude/Longitude 9
GGA – Global Positioning System Fix Data 10
VTG – Course over Ground and Ground Speed 10
RMC – Recommended Minimum Specific GNSS Data 11
GSA – DOP and Active Satellites 11
GSV – Satellites in view 12
PFST,FOM – Position figure of merit 12
PFST,PPS – PPS signal 13

Installation

Step I：Check your GM-168 package

Please check the GM-168 package. If any items are missing or damaging, please contact our distributor immediately.

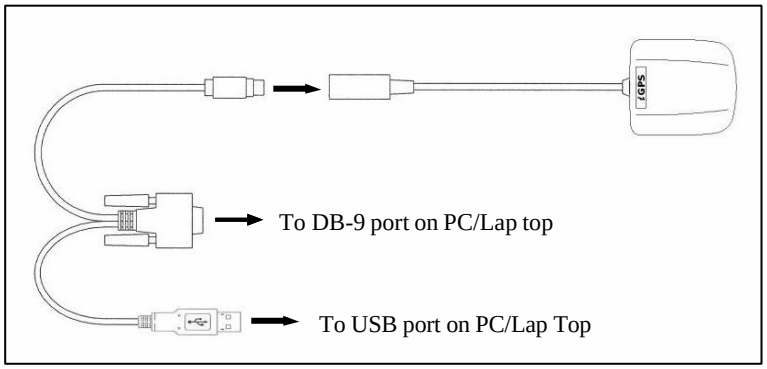
The standard package of GM-168 contains:

- GM-168 Receiver
- GM-168 Driver & Utility CD
- Warranty Card
- Quick Installation Guide
- **RS-232 cable** or **USB cable**

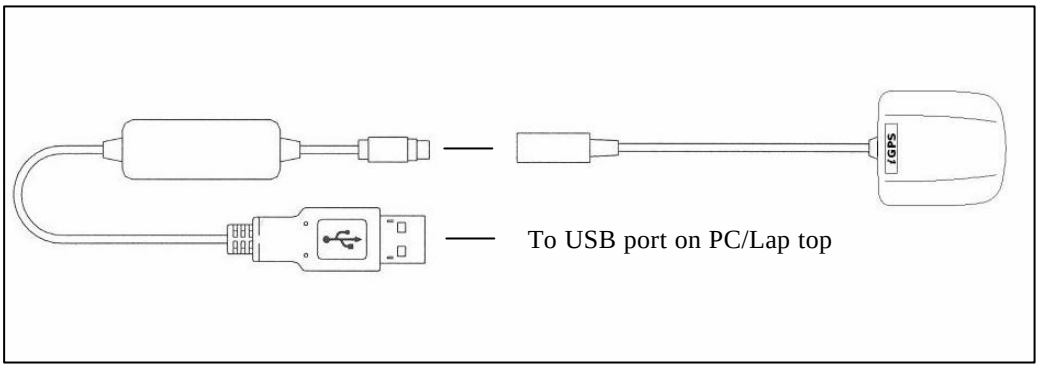
With different brand/type of handheld device, the GM-168 receiver needs to use different type of car charger. Our company provides all kinds of car chargers, please refer to the section of GM-168 car chargers and cables on page 7. If the GM-168 receiver you purchased provides a car charger, please make sure it is suitable for your handheld device.

Step II：Connect GM-168 receiver to PC/Lap top or handheld device

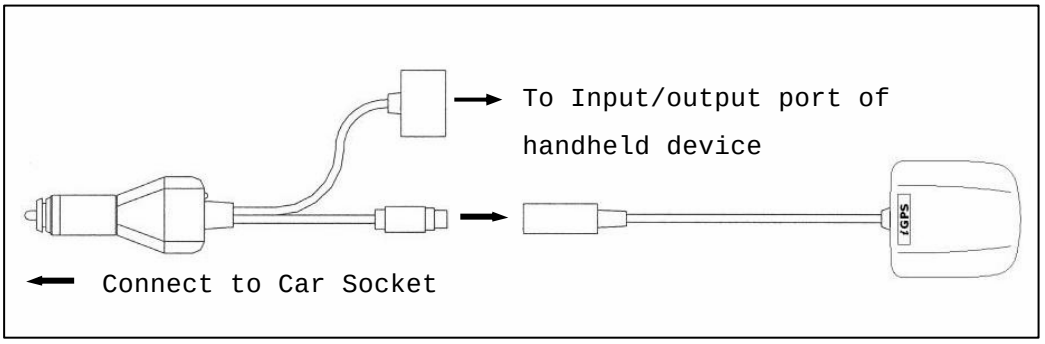
- Using RS-232 cable: please follow the illustration as below.



- Using USB connector: please follow the illustration as below. Before the USB connector plugs in your PC/Lap top, please have your USB Driver Installation ready. (See the **USB Driver installation guide** for detail information). Remember to plug in the USB connector after your PC/Lap top started properly. Otherwise, your PC/Lap top operating system might judge GM-168 as a mouse and affect the normal operation.



- Using car charger: Please follows the illustration as below. You have to plug in the connector into Car Socket in order to have power supply for both GM-168 receiver and handheld device.



Step III：Check if the LED is flashing.

Once your PC/Lap top or car charger supplies power, the GM-168 receiver starts to provide the positioning function. At meantime, the LED will be flashing and it means GM-168 is operating.

Troubleshooting

When your GM-168 receiver could not operate, please follow the instruction to do the troubleshooting as below.

1. GM-168 receiver's LED is not flashing
   - It means GM-168 does not have power supply. Please check if the connector plugs in properly as the step II.
2. GM-168 receiver's LED is flashing, but the connection between GM-168 receiver and the E-map can not be established. Please make sure the settings of COM Port Number and Baud rate are correct.
   - Most of E-map provides scan function to search COM Port. Please scan it for the correct COM Port number that GM-168 receiver is utilizing.
   - If a RS232 cable is used to connect to PC/Lap top, the COM Port number would COM1 usually.
   - The default Baud rate is 4800.
   - If a USB cable is used to connect to PC/Lap top, please make sure the UBS driver is installed successfully.

GM-168 Introduction

The GM-168 is an outstanding high sensitivity GPS receiver. Its excellent performance easily conquers the most difficult tasks.

In addition, it provides various functions to meet customers' demand.

GM-168 employs uNav's powerful GPS solution. It provides marvelous navigation performance under dynamic conditions in areas with limited sky view like urban canyons. It also has high sensitivity for weak signal operation without compromising accuracy. Undoubtedly, GM-168 is the best choice for you.

Market Leading System Performance

Ultra-low, user configurable power management makes GM-168 the lowest power consuming, complete 12-channel iGPS receiver on the market. Nevertheless, there are no compromises in performance. The iGPS receiver has a navigation sensitivity as low as –150dBm making it applicable even for extremely demanding applications and environments.

GM-168 Key Feature

- Thin module form factor – 45mm(L) x 45mm(W) x 8.5mm(H)
- Very Fast TTFF
- Sensitivity: -150dBm (Tracking)
- iTALK and NMEA0183 protocols
- Accurate 1PPS timing output
- iGPS-8MBit Flash Memory

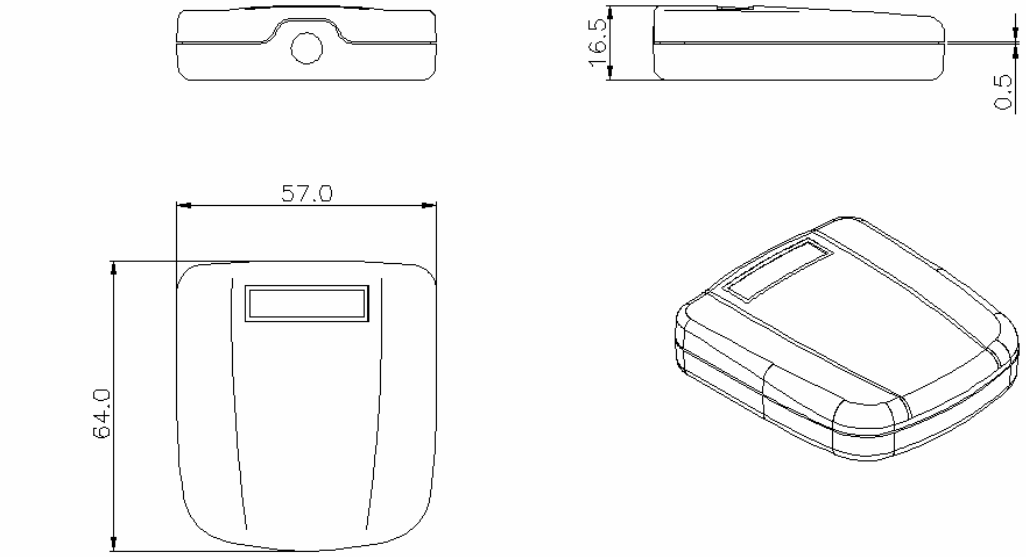
Possible Application

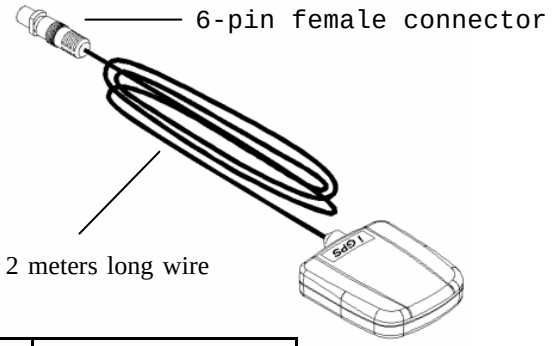
- Mapping devices for PC & Pocket PC
- Personal Navigation or touring devices
- AVL and Location-Based service system
- Data logging for marine Navigation
- Support 1pps output for timer
- Tracking devices/system
- Mileage Management
- Fleet Management
- Car Navigation

Familiarize your GM-168

Dimensions

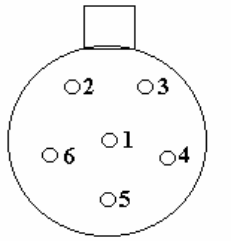
Length：64 mm Width：57 mm Height：16.5 mm Weight：85+/-5 gram





Interface

As shown in the illustration on the right, the length of the wire on GM-168 receiver is 2 meters. There is a 6-pin connector for the connection to PC/Lap top or handheld device. The ping assignment is shown below.



Ping No.	Function
1	1 PPS
2	Tx TTL
3	DC 5V
4	RS232 Rx
5	GND
6	RS232 Tx

Water-proof housing with magnet on the bottom

There are 4 magnets on the bottom side of GM-168 receiver for adsorbing on your car. The housing of GM-168 receiver has waterproof, it can avoid the water permeates your GM-168 receiver while you adsorb it outside of the car.

LED Light

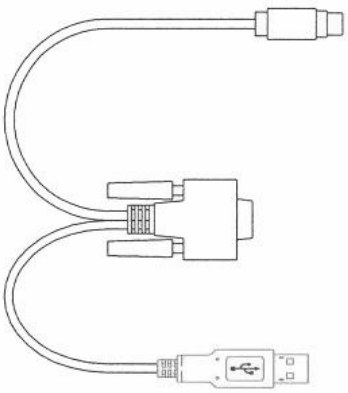
There is an LED light near the output cable on the back of GM-168 receiver. When the GM-168 supplied 5V DC power, the LED will be flashing. It means GM-168 receiver starts to provide the positioning function.

GM-168 Computer/Lap top and handheld device cable

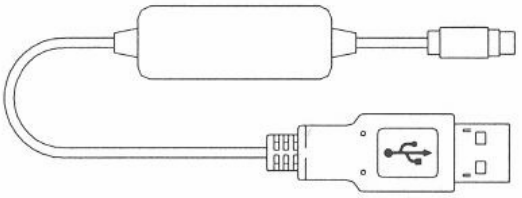
Following table lists each kind of cables for connecting different type of PC/Lap top or handheld device.

Category	Model Number	Type
RS232 cable	GM-168-RS232C	RS232 as I/O, power by USB
USB cable	GM-168-USBC	USB for both I/O and power

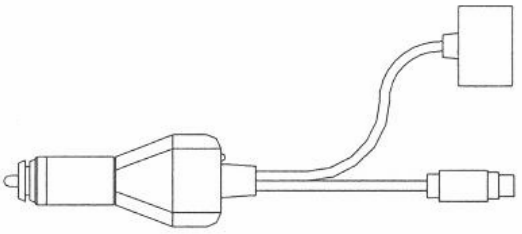
Handheld device cable Remark: While using the GM-168 with handheld device, Car charger would supply power for both GM-168 and handheld device	GM-168-CA-ACER N20	ACER N20
	GM-168-CA-ACER S60	ACER S60
	GM-168-CA-ASUS A600	ASUS A600
	GM-168-CA-ASUS A620	ASUS A620
	GM-168-CA-CASIO E115	Casio E115
	GM-168-CA-CASIO E125/EM500	Casio E125/EM500
	GM-168-CA-CASIO E200	Casio E200
	GM-168-CA-Dell Axim X3	Dell Axim X3
	GM-168-CA-Dell Axim X5	Dell Axim X5
	GM-168-CA-Eten P300	Eten P300
	GM-168-CA-I-PAQ 2200i/38xx/39xx	I-PAQ 2200i38xx/39xx series
	GM-168-CA-I-PAQ 36xx/37xx	I-PAQ 36xx/37xx series
	GM-168-CA-Mitac Mio 338/528	Mitac Mio 338/528
	GM-168-CA-NEC Pocket PC	NEC Pocket PC
	GM-168-CA-O2 XDA II/T-Mobile MDA	O2 XDA II/T-Mobile MDA
	GM-168-CA-O2 XDA/T-Mobile MDA	O2 XDA/T-Mobile MDA
	GM-168-CA-Palm 500/505/T3	Palm 500/505/Tungsten T3
	GM-168-CA-Palm Vx	Palm Vx
	GM-168-CA-Siemens LOOX	Siemens LOOX
	GM-168-CA-Sony N series	Sony N series
	GM-168-CA-Sony T series	Sony T series
	GM-168-CA-Toshiba e330/e740	Toshiba e330/e740
	GM-168-CA-Toshiba e400	Toshiba e400
	GM-168-CA-Toshiba e570	Toshiba e570
	GM-168-CA-Toshiba e800	Toshiba e800
	GM-168-CA-Yakumo Delta 300	Yakumo Delta 300
	GM-168-CA-Yakumo Omnikron	Yakumo Omnikron



RS-232 cable



USB cable



Car charger

Software Interface

NMEA Protocol

GM-168 receiver currently supported 21 NMEA commands and 7 NMEA messages. The NMEA commands include NMEA, START, STOP, STORE, RESTORE, AUTOSTART, FIXRATE, DATUM, PWRDOWN, PPSMODE, SURVEYLEN, CABLEDEL, PPSPOS, PULSEPOS, PULSELEN, INITAID, ALTAID, SETLIMIT, SYNCMODE, SW, and HW. The respond messages include GPGLL, GPGGA, GPVTG, GPRMC, GPGSA, GPGSV, and "PFST,FOM".

NMEA Messages

The NMEA-0813 message consists of fields as following:

$GP<message id>,<data field>,<data field>,,, ..*<checksum><CR><LF>

Message starts with ' $GP' followed by message id field. Message data fields are separated by commas (,) and the message ends after checksum field and carriage return <CR> and line feed <LF> control characters. Delimiter ' *' precedes the checksum field. Note that data fields may be NULL (missing). Null data fields contain no characters but are still separated by commas, for example:

$GPGGA,134158.48,6016.3072,N,02458.3788,E,1,08,1.2,,,,,,0000*1E

GLL – Geographic Position – Latitude/Longitude

Latitude and Longitude, UTC time of fix and status.

Format: $GPGLL,xxmm.dddd,<N|S>, yyymm.dddd,<E|W>,hhmmss.dd,S,M*hh<CR><LF>

Example: $GPGLL,6016.3073,N,02458.3791,E,134157.48,A,A*26

Parameter	Description	Example
xxmm.dddd	Latitude, xx = degrees, mm = minutes, dddd = decimal part of minutes	60 deg. 16.3073 min.
<N|S>	Either character N or character S, N = North, S = South	North
yyymm.dddd	Longitude, yyy = degrees, mm = minutes dddd = decimal part of minutes	24 deg. 58.3791 min
<E|W>	Either character E or character W, E = East, W = West	East
hhmmss.dd	UTC time, hh = hours, mm = minutes, ss = seconds dd = decimal part of seconds	13:41:51.48
S	Status indicator, A = valid, V = invalid	Valid
M	Mode indicator, A = autonomous, N = data not valid	Autonomous
hh	Check sum	26

GGA – Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.

Format:$GPGGA,hhmmss.dd,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,v,ss,d.d,h.h,M,g.g,M,a.a,xxxx*hh<CR><LF>

Example: $GPGGA,134829.48,1126.6639,S,11133.3299,W,1,07,1.0,,,,,,*15

Parameter	Description	Example
hhmmss.dd	UTC time, hh = hours, mm = minutes, ss = seconds, dd = decimal part of seconds	13:48:29.48
xxmm.dddd	Latitude, xx = degrees, mm = minutes, dddd = decimal part of minutes	11 deg. 26.6639 min.
<N|S>	Either character N or character S, N = North, S = South	South
yyymm.dddd	Longitude, yyy = degrees, mm = minutes, dddd = decimal part of minutes	111 deg. 33.3299 min.
<E| W>	Either character E or character W, E = East, W = West	West
v	Fix valid indicator, 0=Fix not valid, 1=Fix valid	Fix valid
ss	Number of satellites used in position fix, 00-12. Fixed length	7 satellites
d.d	HDOP – Horizontal Dilution Of Precision	HDOP = 1.0
h.h	Altitude (mean-sea-level, geoid)	
M	NULL (missing)	
g.g	NULL (missing)	
M	NULL (missing)	
a.a	NULL (missing)	
xxxx	NULL (missing)	
hh	Check sum	15

VTG – Course over Ground and Ground Speed

Course and speed

Format: $GPVTG,h.h,T,m.m,M,s.s,N,s.s,K,M*hh<CR><LF>

Example: $GPVTG,202.60,T,,,0.38,N,0.7,K,A*0D

Parameter	Description	Example
h.h	Heading	202.60
T	Degrees (heading units).	Degree
m.m	Magnetic heading. Currently NULL (missing).	
M	Degrees. Magnetic heading units. Currently NULL (missing).	
s.s	Speed, knots.	Speed = 0.38
N	Knots (Speed unit)	Knots
s.s	Speed, km/h.	Speed = 0.7
K	km/h (Speed units).	km/h
M	Mode indicator, A = autonomous, N = data not valid	Autonomous
hh	Check sum	0D

RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data.

Format: $GPRMC,hhmmss.dd,S,xxmm.dddd,<N|S>,yyymm.dddd,<E|W>,s.s,h.h,ddmmyy,d.d,

<E|W>,M*hh<CR><LF>

Example: $GPRMC,134829.486,A,1126.6639,S,11133.3299,W,58.31,309.62,110200,,,A*14

Parameter	Description	Example
hhmmss.dd	UTC time, h = hours, mm = minutes, ss = seconds, dd = decimal part of seconds	13:48:29.486
S	Status indicator, A = valid, V = invalid	Valid
xxmm.dddd	Latitude, xx = degrees, mm = minutes, dddd = decimal part of minutes	11 deg.
<N|S>	Either character N or character S, N = North, S = South	26.6639 min.
yyymm.dddd	Longitude, yyy = degrees, mm = minutes, dddd = decimal part of minutes	111 deg. 33.3299 min.
<E|W>	Either character E or character W, E = East, W = West	West
s.s	Speed, knots.	58.31 Knots
h.h	Heading	309.62 deg.
ddmmyy	Date, dd = date, mm = month, yy = year	11th, Aug. 2000
d.d	Magnetic variation	
<E|W>	Declination. Either character E or character W, E = East, W = West	
M	Mode indicator, A = autonomous, N = data not valid	Autonomous
hh	Check sum	14

GSA – DOP and Active Satellites

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA sentence, and DOP values.

Format: $GPGSA,a,b,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p.p,h.h,v.v*hh<CR><LF>

Example: $GPGSA,A,3,03,15,17,18,22,23,,,,,,,4.7,3.7,2.9*37

Note:

Parameter	Description	Example
a	Mode: M = Manual, forced to operate in 2D or 3D mode. A = Automatic, allowed to automatically switch 2D/3D.	Automatic
b	Mode: 1 = Fix not available, 2 = 2D, 3 = 3D	3D
xx	ID (PRN) numbers of GPS satellites used in solution	03,15,17,18, 22,23
p.p	PDOP	PDOP = 4.7
h.h	HDOP	HDOP = 3.7
v.v	VDOP	VDOP = 2.9
hh	Check sum	37

GSV – Satellites in view

Number of satellites in view, satellite ID (PRN) numbers, elevation, azimuth, and SNR value. The information for four satellites maximum per one message, additional messages up to maximum of eight sent as needed. The satellites are in PRN number order. Before a position fix is acquired the information contains only the SNR (signal to noise ratio) value. After a fix is acquired, also the elevation and azimuth angles are added. Note that there can be also "theoretical" satellites in the GSV message. These are satellites of which the angles (elevation, azimuth) are known but for some reason, e.g. due to an obstruction, have not been found by iTrax02. The
SNR value for these satellites is therefore zero.

Format: $GPGSV,n,m,ss,xx,ee,aaa,cn,…… ,xx,ee,aaa,cn*hh<CR><LF>

Example:

$GPGSV,4,1,14,03,66,207,50,08,09,322,44,11,01,266,42,14,00,155,00*79

$GPGSV,4,2,14,15,41,088,48,17,21,083,44,18,57,087,51,21,57,173,50*78

$GPGSV,4,3,14,22,05,203,00,23,52,074,49,26,17,028,44,27,00,300,00*79

$GPGSV,4,4,14,28,32,243,00,31,48,286,00*70

Note: There are 14 satellites in view. The examples in following table only explain the information of satellite No.03 on the first message.

Parameter	Description	Example
n	Total number of messages, 1 to 9	4 messages
m	Message number, 1 to 9	Message No.1
ss	Total number of satellites in view	14 satellites
xx	Satellite ID (PRN) number	No.03
ee	Satellite elevation, degrees 90 max	66 deg.
aa	Satellite azimuth, degrees True, 000 to 359	207 deg.
cn	SNR (C/No) 00-99 dB-Hz. zero when not tracking	50 dB-Hz
hh	Check sum	79

PFST,FOM – Position figure of merit

Figure of merit (FOM) value for the position fix. Indicates the accuracy of the position in meters. The FOM value cannot be calculated before at least one fix has been made with more than four observations (five satellites, or four satellites and an altitude aid); before that a value "–1" is reported, indicating that FOM is not available yet. After this the FOM value is always available the only exception being the altitude aiding modes when a fix has been calculated using three satellites.

Format: $PFST,FOM,n*hh<CR><LF>

Example: $PFST,FOM,3*66

Parameter	Description	Example
n	Position FOM value, i.e. the position accuracy in meters.	3 meters
hh	Check sum	66

PFST,PPS – PPS signal

The pulse per second message. Indicates the parameters of the PPS pulse that will shortly be outputted. Provides the current GPS time and timing correction of the coming PPS pulse.

Format: $PFST,PPS,wwww,tttttt,n,xxxx*hh <CR><LF>

Example: $PFST,PPS,1161,309566,9,495*67

Parameter	Description	Example
wwww	GPS Week, i.e. number of full weeks elapsed since midnight 5-6 January 1980.	1161 weeks
tttttt	Time of Week (seconds from the beginning of the current GPS week).	309566 sec.
n	Number of satellites used when calculating the solution.	9 satellites
xxxx	Short-time pulse offset of the physical PPS pulse signal (units of 0.01 ns, in range of approx. -15.3 .. 15.3 ns). The correct pulse time can be calculated by subtracting this offset from the physical PPS pulse instant.	4.95 ns
hh	Check sum	67